

DOCUMENT RESUME

ED 398 888

IR 018 068

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TITLE Using the Web for Teaching: School and Community Sites.
PUB DATE 96
NOTE 10p.; In: Call of the North, NECC '96. Proceedings of the Annual National Educational Computing Conference (17th, Minneapolis, Minnesota, June 11-13, 1996), see IR 018 057.
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Access to Information; *Community Education; *Computer Assisted Instruction; Disadvantaged; Health Education; *Information Sources; Instructional Innovation; Instructional Materials; *Internet; User Needs (Information); *World Wide Web
IDENTIFIERS Health Information

ABSTRACT

Widely available Internet resources can now be used effectively both in a formal educational setting as well as for the general public. This paper describes two ways health education professionals and educators have used the World Wide Web for teaching. In the first instance, a community education effort is described. It is intended to reach women concerned about breast cancer and assist them in locating information appropriate to their health needs. A key concern in preparing such a Web site was that of assuring easy access, particularly for socioeconomically disadvantaged women and families. In the second instance, the World Wide Web was used to augment classroom instruction by making course materials available electronically. The concern in this instance was whether instructional resources could be expanded for students in the "traditional" scheduled classes by encouraging use of the Internet resource through pre-selection. (Contains 10 references.) (AEF)

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Paper Using the Web for Teaching: School and Community Sites

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Key Words: community, course, development, teaching, access, Web

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"Call of the North"

Abstract

Teachers and health education professionals can use the World Wide Web for teaching. First, a community education effort is described to reach women concerned about breast cancer. A key concern in preparing such a Web site is that of access—can the intended audience gain easy access to information resources? Secondly, the Web is used to augment classroom instruction by making course materials available electronically. The key concern is whether instructional resources can be expanded by encouraging use of Internet resources through pre-selection.

The rapidly changing technological developments in the area of telecommunications and computing in the late 20th century have revolutionized the way that human beings communicate with one another. Just as the development of the printing press by Gutenberg in the fifteenth century resulted in books for the common man and the development of the telephone in the nineteenth century revolutionized personal communications, recent developments in emerging technologies have resulted in new communication and education paradigms. These new paradigms embrace new technology and capitalize on its strengths. In particular, the use of Internet resources gives educators the ability to present both new and familiar educational materials in any subject to students in an innovative way over the network. Widely available Internet resources can now be used effectively to educate individuals both in and out of formal educational institutions.

This paper describes two ways for teachers and health education professionals to use the World Wide Web for teaching. In the first instance a community education effort will be described that is intended to reach women concerned about breast cancer and assist them in locating information appropriate to their health needs. A key concern in preparing such a Web site is that of access—can the intended audience gain easy access to information source? And, is the information thus made available worth the effort of seeing information in this electronic fashion? In the second instance, the World Wide Web has been used to augment classroom instruction by making course materials available electronically. The key concern here is whether instructional resources can be expanded for students in "traditional" scheduled classes by encouraging use of Internet resource through pre-selection.

The World Wide Web as a Resource for Education

The World Wide Web, a part of the Internet that has a graphical, point-and-click user-friendly interface, can be used effectively as a tool by educators to disseminate information to audiences as narrow as a single classroom, or as broad as the world. For classroom use, teachers may provide a variety of course descriptive materials online, develop innovative computer-based instructional materials and provide access to resources located on servers around the world via the Web. As a global educational tool, the Web can provide a wide range of information and resources to the public in an easy to use format from a single starting point, the Home Page. Through the use of other network resources such as electronic mail, individuals world-wide can share their knowledge and experience. Thus, the Internet is an important tool for teachers in a formal educational setting as well as an important educational resource for the general public.

The strengths of a World Wide Web information resource for the general public are numerous. First, it is user-friendly and can provide a comprehensive and accurate resource for individuals world-wide. An example of a public information resource on the World Wide Web is The University of Minnesota Cancer Center Home Page. This resource, designed to help cancer patients and their families, draws on the strength of the body of knowledge and state of the art expertise of medical, education, and research

personnel at the University of Minnesota. It also provides a valuable link between the University of Minnesota and health care professionals providing a link to up-to-date cancer information for outstate practitioners. The University of Minnesota Cancer Home Page broadens the educational scope of the University of Minnesota Cancer Center for the public, patients, their families, and practitioners.

A breakthrough technology, the World Wide Web is rapidly growing in use and acceptance. The number of women currently using the network has increased from a ratio of nine male users to every female user to two male users to every female user (Lewis, 1995). A public information resource such as the University of Minnesota Cancer Center Home Page fosters the coordination of basic and clinical research, improves patient care through the dissemination of timely information, and provides a central source of accurate educational materials to cancer patients and their families.

Access Issues

The greatest potential limitation inherent in the development of this type of educational resource for cancer patients is that its use is restricted to people who have access to the technology.

As more cancer information is anchored to databases, often the quickest way to acquire it is through the Internet, the global network of computers. But because many Americans lack access to the Internet, or even to a computer, public libraries are working toward becoming information equalizers, to reduce the gap between cancer information "haves" and "have nots" by providing access to information on the Internet (Nelson, 1995).

Since computer ownership is more prevalent among upper class women, a concern that needs to be addressed is that underprivileged women are potentially left out. This limitation has been the focus of a number of articles which forecast the development of a society that is stratified by technological skills, knowledge, and computer access into the "haves" and "have-nots" (Negroponte, 1995). Currently, there are grassroots efforts to provide more public access to technological resources and to educate minorities in computer skills (Gardy, 1995). The need for increased public access to the Internet is being addressed by many states and municipalities with the installation of computers connected to the Internet in public areas such as libraries. For example, New York has a program called the Global Access Information Network (GAIN), Maryland has the "Gateways" project (Nelson, 1995), and Blacksburg, Virginia is in the process of creating "Virtual Blacksburg" to put the entire city online and connect its residents. Blacksburg provides free computer training and access for its citizens in municipal buildings. Colorado plans to put four personal computers in libraries in each rural or frontier county (Nelson, 1995). Iowa has installed a fiber optic network in its state-wide library system and the University of Iowa has developed the "Virtual Hospital" for continuing medical education and patient information (Nelson, 1995). Other states, such as Kentucky and Minnesota offer reduced rate Internet connections to alumni and "friends of the University" using existing University computer resources.

Minority access to online resources is a concern that is currently being studied. Based on a survey of 55,000 households in 1993, the Census Bureau estimated that 37.5 percent of whites were using computers at home, at work or in places like public libraries compared with 25 percent of blacks, and 22 percent of Hispanic people (Williams, 1995). It is unclear whether this difference is "due to technophobia, job patterns (for example, professionals use computers more than laborers do), or priorities that place computers near the bottom of the list of necessities. African Americans who champion the merits of new technology say that no one can afford to ignore it (Williams, 1995). To combat this problem, groups of African American journalists,

engineers, and computer-service providers are beginning to hold forums, private meetings, and online conversations across the country to discuss ways to get more African Americans wired in, with the goal to demystify computers and help people use technology to simplify their lives. Groups of computer professionals in the minority community have also formed volunteer groups to teach computer classes after hours. Finally, in order to insure that technology is available to everyone, some African American politicians and community leaders are seeking public and private financing to establish information centers in churches, libraries and community centers to provide greater access to computers (Williams, 1995).

Advantages of the World Wide Web

The World Wide Web is different from other Internet media since it incorporates text, sound, video, high-resolution graphics, animation, and still photograph files into one seamless, transparent, and user-friendly application. The user accesses World Wide Web sites through the use of browsing software applications such as *Netscape*, *Lynx*, and *Mosaic*. These applications link sites locally or internationally through the use of hypertext "hot links" which appear in a different color from other text in the documents. By clicking the computer mouse on these "hot links," the user jumps from site to site to access information relevant to the topic of interest. The hypertext provides a link to other related documents.

As a part of the Internet, the World Wide Web, is a widespread information resource in cyberspace that is inexpensive and easy to use. It has the capability to provide a consistent interface to other information systems such as Gopher, a menu-based resource; Wide Area Information Servers (WAIS), which allow keyword searches; File Transfer Protocol (FTP); and USENET newsgroups. The Web is accessible through virtually all current computer platforms.

Cyberspace

The term "cyberspace" originated in science fiction literature produced in the 1980s. Although the term lacks a precise definition, according to David Ronfelt (1992) it has come to be the preferred term for envisioning the electronic stocks and flows of information, the providers and users of that information, and the technologies linking them as a new realm or system that has a functioning identity as significant as an economic or political system.

Initially cyberspace was the elite realm of military personnel, scientists, and academicians who used the Internet to collaborate and to communicate research findings with one another. The Internet, a loose network of thousands of computers located all over the world, may be visualized as a "cloud of resources encircling the globe" (LaQuey, 1993). It provides a powerful, international communications network and allows scientists access to expensive hardware resources. This giant network comprised of thousands of networks functions due to the interoperability of its numerous components. "Interoperability is the capacity of many diverse systems to work together to enable communication. It can occur only if the computers and the network hardware adhere to certain standards" (LaQuey, 1993). These standards are the protocols, TCP/IP or Transmission Control Protocol/Internet Protocol, necessary for computers with mismatched operating systems to send and receive messages from one another. By providing a fast and efficient global means of communication, the Internet has transcended its original purpose. Today the Internet is not only used as a communications tool by military personnel, scientists, and academicians but also by the business sector, educators, students and ordinary citizens via commercial online and telecommunications services.

Precursor Events

The development of an affordable microcomputer in the 1980s, a precursor event, resulted in the proliferation of the computer in the business environment, in educational settings, and in the home. According to Nicholas Negroponte (1995), director of MIT's Media Lab, 35 percent of households have at least one computer and 70 percent of PC sales this year will be home computers. These statistics are indications of an important social trend. An increasing number of people of all ages are becoming computer literate, and potentially have access to the resources available online.

The fall in the cost of computer and telecommunications hardware, along with increased ease of access to the Net is resulting in a dramatic increase in the size of the electronic community. The Web is further fueling this trend. It is being seen in many quarters as the universal, user-friendly front end to the Internet and as a tangible manifestation of the Clinton administration's idea of the Information Superhighway (Ford, 1995).

Until recently, Internet access for the average user was difficult. The increasing interest of the business sector in Internet use created demand for the development of navigation software and a user-friendly interface. The World Wide Web is different from other Internet interfaces since it incorporates text, sound, video, high-resolution graphics, animation and still photograph files into one seamless, transparent and user-friendly application. The user accesses World Wide Web sites through the use of browsing software applications such as *Netscape*, *Mosaic*, *Lynx*, *Cello*, and *MacWeb*. These browser applications, available to consumers free of charge over the network, link sites internationally through the use of hypertext links "hot words" which appear in a different color or punctuation from other text in the documents. The initial access point for Web users is a "Home Page"—a computer screen at a World Wide Web location that is analogous to the table of contents in a magazine. It may contain text, colorful graphics, and "hot word" links. The Home Page provides an enticing glimpse of the various types of information which may be accessed from that point, and functions in a way similar to a menu screen. With the click of the computer mouse on these "hot words," the user jumps from site to site to access information relevant to the topic of interest. Through the use of these hypertext links, a Web Home Page is able to communicate a large amount of very detailed information to a client who actively seeks the desired information at his leisure through his computer. Virtual communities of people with similar needs and interests have developed. These communities communicate online through listservs and newsgroups. Listservs can be used by classroom teachers as an effective educational tool. Using a class listserv as a forum for online discussion, teachers may post questions to be answered by members of the class, and require that students both answer a number of questions electronically as well as respond to their classmates comments.

Education Online

"Creating online documents, especially those incorporating new media, demands new knowledge and skills" (Horton, 1994). Online documentation is primarily a visual medium and relies heavily on drawings, diagrams, photographs, charts, tables, and lists. In the construction of Web documents, educators may identify critical elements of knowledge and use various computer software applications to effectively present material for retention and transfer of knowledge to the learner. With multiple links to various documents and other resources, students can access material of different levels of complexity and depth.

Use of the computer for educational programs also ensures that each student receives the same instruction and may repeat sections of the program as many times as needed for understanding. The student may advance through the information at his own pace, in a private setting, then generate written print-outs of instructions or assignments. Through the use of electronic networks such as the World Wide Web, students may access large databases of information from multiple international sources quickly, easily, and over a period of time. They can also use listservs, discussion groups, and e-mail to communicate with others who share similar needs and concerns.

The computer is an important tool for education professionals, especially educators who work in isolation in rural areas without adequate information resources. For these professionals, the World Wide Web provides a powerful and convenient source of current information. Through the use of electronic search tools and databases such as ERIC it is possible to locate publications online in a matter of minutes. It will also provide a forum for the exchange of ideas. Through the use of network tools such as listservs and discussion groups, educators may consult with colleagues, and rapidly share new knowledge and techniques to a broad audience. With its multimedia capabilities, the World Wide Web, can be utilized to disseminate digitized images adding another dimension to this valuable resource.

Hypermedia

What makes the Web powerful is a software technique known as hyperlinking. In the composition of a page for the World Wide Web, an author uses Hypertext Markup Language (HTML) to create hyperlinks—words that appear in a different color or bold type and indicate a link to some other information. Hypertext is a means of accessing information that is stored in diverse locations in a way that is independent of the user's need to know where the information is located. With the click of the mouse the user can access the information contained in the hyperlink—whether it is contained in the same system as the initial page—or residing on a computer server located on the other side of the planet.

Hypertext, a subset of hypermedia, refers specifically to computer-based documents in which readers move from one place in a document to another or between documents in a nonlinear or nonsequential manner. This means that the reader doesn't access information in a traditional beginning-to-end fashion. In a nonlinear computer document, the user moves randomly through the document. Words, phrases, and icons in the document become links that enable the user to jump at will to a new location in the document or even to a new document. Part of the power of the World Wide Web is that the user has a simple, single point and click interface to the vast body of information located on the Internet. Other Internet software resources such as Gopher, which has a menu interface, and WAIS (Wide Area Information Server), which conducts searches based on keywords, provide the user with singular search capabilities. Through the client-server architecture of a Web browser, the user has a seamless, transparent interface to both hypertext and non-hypertext systems.

The advantages of a hypertext system such as the World Wide Web as an educational resource for health care professionals were recognized and introduced by The Case Western Reserve Medical Education System in 1955 (Henry, 1990). Their system embraced elements of hypertext emphasizing organ systems and disease through an integrated curriculum. The use of hypertext in their instructional system allowed students to see the relationships both within a discipline or body of knowledge and to connect different bodies of knowledge to gain a wider view. Students were able, through the capabilities of the computer, to navigate and browse through varied materials. This activity is similar to reading an article and then going to the library for citations and further definitions or references (Henry, 1990).

Thus, the hypertext format of the World Wide Web has important advantages for users. First, hypertext provides an effortless point and click means of navigation between both documents and topics. Since the construction of the links between topics and documents is not hierarchical, the user can rapidly follow ideas as the thoughts emerge. It is the user, not the computer systems administrator, that decides which information is important and in what sequence it will be called up to the computer screen. Hypertext and hypermedia also allow the user to browse through a large quantity of information located at various sites quickly. It is very easy for the user to follow cross-references. The hypermedia aspect of the World Wide Web provides graphical, audio and video information along with textual information, which clarifies concepts visually in a way that text-based information alone cannot. Hypermedia also facilitates cognitive flexibility because it allows a topic to be explored in multiple ways, using a number of different concepts or themes. Integrated multimedia environments, such as the World Wide Web, bring together the symbolic and processing capabilities of various media to help learners connect new knowledge to old knowledge (Kozma, 1991).

Classroom Use

As a classroom tool, the World Wide Web provides a means for educators to post all of their class materials online and to provide students with access to Internet resources at other institutions and remote sites around the globe. One advantage to this approach is that students are able to review course materials online prior to course registration and to evaluate which courses best fit their needs. Another advantage is that all of the information that students need to complete the course requirements is easily accessible at any time from a central source.

Through the use of hypertext links, teachers can utilize Internet resources from a variety of institutions and link reading materials such full-text journal articles to the class home page. Not only is paper saved by avoiding the copying of library materials, but more current periodical literature can be made available to students than is otherwise possible. These are resources that may be difficult for students to find on their own, and the manuscripts are likely to be more timely than if persons had to wait for their arrival through traditional print journals. Even refereed material can be made available more quickly electronically than it could in paper print form.

The course materials for two class designed for pre-service teachers in the business education field have been prepared for distributed through World Wide Web pages. All descriptive class materials including the course title, description, syllabus, requirements and schedule, previously distributed to students in print, are available online. Contact information for the professor including office location, office hours, telephone number and e-mail address are listed. The Home Pages are organized in three main documents: Course Description, Course Requirements, and Course Schedule. Students can move easily through these documents to access the course description and objectives, course requirements, including assignments, grading criteria, guidelines for assignment completion, Internet access information and course policies.

Hyperlinks to bibliographies provide students with a reference lists which enable them to complete written course assignments. The course schedule includes hypertext links for each class meeting. By clicking on a specific meeting date, students can access each week's reading assignments (paper-based and electronic) and a list of assignments due that day. Additional links within this file allow point-and-click access to Internet resources located at remote sites around the world. For example, students can link to the National Center for Research in Vocational Education Home Page at the University of California, Berkeley. From this, and other sites, students can access complete online publications and documents to complete reading assignments. The use of the World Wide Web as an instructional tool allows the professor to post all course information

online, to update it easily, and to permit—even encourage—students to readily utilize Internet resources. It immediately conveys the message that the Internet is indeed a course resource ready for students' immediate use.

Community Education

The University of Minnesota Cancer Center Web site has three main objectives. These objectives include provision of basic information about the Cancer Center itself and information for patients and their families about the disease of cancer, its treatment, and current advances in research. The final objective is for University of Minnesota researchers to access and share information with other professionals worldwide.

Home Page links are provided to three different categories of information about the Cancer Center. The first category is the Cancer Center Information Guide which provides basic information about the Cancer Center itself and includes a photograph, map, location, mission, departments and staff specialties. The second category includes information about the diseases and their treatment, treatment options, general recommendations for prevention and recent findings. Other information is of personal benefit to patients and their families, such as information about national and local support groups, the Ronald McDonald House, Frequently Asked Questions, and educational programs. The hypermedia aspect of the World Wide Web is particularly valuable for this type of project because through a simple point and click of the mouse on hyperlinks, definitions, video, graphics, and sound files may be retrieved quickly and easily to clarify concepts for patients in very concrete ways. For example, photographic images of microscopic slides show the difference between normal and cancerous cells visually. The third category of information provided by the Cancer Center Home Page is for medical professionals and researchers. This category includes recent findings, links to abstracts and full text papers as well as other resources such as the National Cancer Institute and the National Institutes of Health. Since this type of information is rapidly changing, it is particularly efficient to disseminate timely information electronically rather than in print materials.

Patients with computers, Internet access and World Wide Web browser software in their homes or places of business are able to access this resource at their leisure 24 hours a day. This feature of Internet use provides the advantage of time and privacy. The information provided has the potential to help patients deal with emotional trauma, learn more about the disease, and learn how their lives will be affected, as well as explore treatment options.

The World Wide Web is a resource that is widespread and easy to use due to its graphical point-and-click user interface. This resource can be effectively used as an educational tool by teachers in formal school settings and in the community for public health information. The challenge is to provide regular and easy access to appropriate technology and to develop and maintain current information resources through Home Page creation and regular updating.

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